

Application. No. 10/623,665  
Atty. Docket No. 7090/USAPO1/NBD/OPTICS/TB1 (107262.199US1)

### Amendments to the Claims:

This listing of the claims will replace all prior versions, and listings, of claims in the application:

### Listing of Claims:

1. (Currently Amended) An article of manufacture comprising an optical-ready substrate made at least in part of a first semiconductor material and having a front side and a backside, said front side having a top surface that is of sufficient quality to permit microelectronic circuitry to be fabricated thereon using semiconductor fabrication processing techniques, said optical-ready substrate including an optical signal distribution circuit fabricated ~~on the front side of the substrate~~ in a first layer region beneath the top surface of the substrate, said optical signal distribution circuit ~~made up of interconnected semiconductor photonic elements and~~ designed to provide signals to the microelectronic circuitry to be fabricated thereon, said optical signal distribution circuit made up of semiconductor photonic elements interconnected by an optical waveguide for carrying an optical signal characterized by a wavelength of about 850 nanometers or less.

2. (Currently Amended) The article of manufacture of claim 40 + wherein the first layer region has a surface that defines said top surface of the optical-ready substrate.

3. (Currently Amended) The article of manufacture of claim 2 wherein the semiconductor photonic elements of the optical distribution circuit include an optical waveguide and output ~~element~~ elements coupled to the optical waveguide ~~waveguides~~ for delivering signals carried by the waveguide ~~waveguides~~ to the microelectronic circuitry.

4. (Currently Amended) The article of manufacture of claim 3 wherein said output ~~element is an~~ elements are optical detector ~~detectors~~ which convert optical signals to electrical signals.

5. (Currently Amended) The article of manufacture of claim 3 wherein said output ~~element is an~~ elements are optical element ~~elements~~ that function to redirect light signals

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traveling within the waveguide ~~waveguides~~ upward toward the top surface of the semiconductor substrate.

6. (Canceled)

7. (Canceled)

8. (Original) The article of manufacture of claim 2 wherein the optical signal distribution circuit is an optical clock signal distribution network.

9. (Original) The article of manufacture of claim 2 wherein the first semiconductor material is silicon.

10. (Currently Amended) The article of manufacture of claim 40 ~~+~~ wherein the optical-ready substrate comprises a carrier substrate that is made at least in part of the first semiconductor material and a layer of second semiconductor material on top of and defining an interface with the carrier substrate, and wherein said optical signal distribution circuit is fabricated in the carrier substrate at the interface between the carrier substrate and the second semiconductor layer and wherein the layer of second semiconductor material defines the top surface of the optical-ready substrate.

11. (Currently Amended) The article of manufacture of claim 10 wherein the semiconductor photonic elements of the optical distribution circuit include an optical waveguide ~~and output element elements~~ coupled to the optical waveguide ~~waveguides~~ for delivering signals carried by the waveguide ~~waveguides~~ to the microelectronic circuitry.

12. (Currently Amended) The article of manufacture of claim 11 wherein said output element is an ~~elements are~~ optical detector ~~detectors~~ which convert~~s~~ optical signals to electrical signals.

13. (Currently Amended) The article of manufacture of claim 11 wherein said output element is an ~~elements are~~ optical element ~~elements~~ that function~~s~~ to redirect light signals traveling within the waveguide ~~waveguides~~ upward toward the top surface of the semiconductor substrate.

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14. (Canceled)

15. (Canceled)

16. (Original) The article of manufacture of claim 10 wherein the optical signal distribution circuit is an optical clock signal distribution network.

17. (Original) The article of manufacture of claim 10 wherein the first semiconductor material is silicon.

18. (Original) The article of manufacture of claim 10 wherein the second semiconductor material is silicon.

19. (Currently Amended) The article of manufacture of claim ~~40~~ 4 wherein the optical-ready substrate comprises a carrier substrate, an insulator layer on top of the carrier substrate, and a layer of second semiconductor material on top of the insulator layer, and wherein said optical signal distribution circuit is fabricated in the carrier substrate immediately below the insulator layer and wherein the layer of second semiconductor material defines the top surface of the optical-ready substrate.

20. (Currently Amended) The article of manufacture of claim 19 wherein the semiconductor photonic elements of the optical distribution circuit include ~~an optical waveguide~~ and output ~~element~~ elements coupled to the optical ~~waveguide~~ waveguides for delivering signals carried by the ~~waveguide~~ waveguides to the microelectronic circuitry.

21. (Currently Amended) The article of manufacture of claim 20 wherein said output elements are optical detectors which convert optical signals to electrical signals.

22. (Currently Amended) The article of manufacture of claim 20 wherein said output elements are optical elements that function to redirect light signals traveling within the waveguides upward toward the top surface of the semiconductor substrate.

23. (Canceled)

24. (Canceled)

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25. (Original) The article of manufacture of claim 19 wherein the optical signal distribution circuit is an optical clock signal distribution network.

26. (Original) The article of manufacture of claim 19 wherein the first semiconductor material is silicon.

27. (Original) The article of manufacture of claim 19 wherein the second semiconductor material is silicon.

28. (Original) The article of manufacture of claim 19 wherein the insulator is made of  $\text{SiO}_2$ .

29. (Currently Amended) An article of manufacture comprising an optical-ready substrate including a carrier substrate made at least in part of a first semiconductor material, an insulator layer on top of the carrier substrate, and a layer of second semiconductor material on top of the insulator layer, said layer of second semiconductor material defining a top surface that is of sufficient quality to permit microelectronic circuitry to be fabricated thereon using semiconductor fabrication processing techniques, said optical-ready substrate also including an optical signal distribution circuit fabricated in the carrier substrate immediately below the insulator layer, ~~said optical signal distribution circuit made up of interconnected semiconductor photonic elements~~ and designed to provide signals to the microelectronic circuitry to be fabricated ~~thereon~~ in the layer of second semiconductor material, said optical signal distribution circuit made up of semiconductor photonic elements interconnected by an optical waveguide for carrying an optical signal characterized by a wavelength of about 850 nanometers or less, and wherein the first semiconductor material comprises silicon.

30. (Currently Amended) The article of manufacture of claim ~~40~~ 29 wherein the ~~first and second semiconductor materials are~~ material is silicon and wherein the insulator is made of  $\text{SiO}_2$ .

31. (Currently Amended) The article of manufacture of claim ~~40~~ 29 wherein the optical signal distribution circuit is an optical clock signal distribution network.

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32. (Currently Amended) A method of producing an optical-ready substrate on which microelectronic circuitry can later be fabricated, said method comprising:

~~by using a first set of semiconductor processes, fabricating an optical-ready semiconductor substrate~~

providing a carrier substrate made at least in part of a first semiconductor material and having a front side and a backside,

by using the first set of semiconductor fabrication processes, fabricating optical signal circuitry on the front side of the carrier substrate designed to provide signals to the microelectronic circuitry to be fabricated thereon at a later time, said optical signal circuitry made up of semiconductor photonic elements interconnected by an optical waveguide for carrying an optical signal characterized by a wavelength of about 850 nanometers or less, and wherein the first carrier substrate comprises silicon; and

creating a top surface above the optical signal circuitry that is of sufficient quality to permit the microelectronic circuitry to be fabricated thereon using a second set of semiconductor fabrication processes; and

sending the optical-ready substrate to a purchaser that will subsequently fabricate microelectronic circuitry thereon by using a second set of semiconductor processes.

33. (Canceled)

34. (Currently Amended) The method of claim ~~32~~ 33 wherein the step of fabricating the optical signal circuitry comprises fabricating an optical clock signal distribution network.

35. (Currently Amended) The method of claim ~~32~~ 33 wherein the step of creating involves fabricating an SOI structure.

36. (New) The article of manufacture of claim 1 wherein the first layer region beneath the top surface of the substrate is silicon.

37. (New) The article of manufacture of claim 36 wherein the optical waveguide includes a core made of a material selected from the group consisting of silica and silicon oxynitride.

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38. (New) The article of manufacture of claim 37 wherein the core comprises silica.
39. (New) The article of manufacture of claim 38 wherein the silica of the core is doped with  $\text{GeO}_2$ .
40. (New) The article of manufacture of claim 37 wherein the optical waveguide includes a cladding material surrounding the core.
41. (New) The article of manufacture of claim 40 wherein the cladding material comprises silica.
42. (New) The article of manufacture of claim 29 wherein the first layer region beneath the top surface of the substrate is silicon.
43. (New) The article of manufacture of claim 42 wherein the optical waveguide includes a core made of a material selected from the group consisting of silica and silicon oxynitride.
44. (New) The article of manufacture of claim 43 wherein the core comprises silica.
45. (New) The article of manufacture of claim 44 wherein the silica of the core is doped with  $\text{GeO}_2$ .
46. (New) The article of manufacture of claim 43 wherein the optical waveguide includes a cladding material surrounding the core.
47. (New) The article of manufacture of claim 46 wherein the cladding material comprises silica.